**CLEAN DEVELOPMENT MECHANISM**
**PROJECT DESIGN DOCUMENT FORM (CDM-PDD)**
**Version 03 - in effect as of: 28 July 2006**

**CONTENTS**

## SECTION A. General description of project activity

### A.1. Title of the project activity:

>>
CGN Inner Mongolia Zhurihe Phase II Wind Farm Project
PDD version 4.0
Completed on 03/06/2010

**PDD revision history**

| PDD version | Time | Note |
|---|---|---|
| Version 1.0 | 20/04/2009 | For CDM approval meeting of Chinese DNA |
| Version 1.1 | 28/07/2009 | Internal QA, GSP |
| Version 2.0 | 19/10/2009 | Revised based on the draft validation report and the latest request of EB meeting |
| Version 3.0 | 09/11/2009 | Revised with the updated *Tool to calculate the emission factor for an electricity system* (version 02) |
| Version 4.0 | 03/06/2010 | Revised based on the request of the completeness check |

### A.2. Description of the project activity:

>>
CGN Inner Mongolia Zhurihe Phase II Wind Farm Project (hereinafter referred to as the proposed project) is located in the Zhurihe Town, Sonid You Qi, Xilinguole League, Inner Mongolia Autonomous Region, P. R. China. The project is developed by CGN Wind Power Co., Ltd. Based on the condition of the project site, the proposed project is to install and operate 25 wind turbines, each of which has a capacity of 2000kW; therefore, the total installed capacity of the proposed project is 50MW. The proposed project is expected to generate 125,573 MWh per year, which will be sold to the North China Power Grid (NCPG). It is ex-ante estimated that the project will generate average annual emission reduction of about 119,319 $tCO_2e$.

The proposed project will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. Furthermore, the proposed project will improve air quality and local livelihoods and promote sustainable renewable energy industry development. The proposed project promotes local sustainable development through the following aspects:

- generate renewable electricity;
- reduce greenhouse gas emissions in China compared to a business-as-usual scenario;
- create local employment opportunity during the assembly and installation of wind turbines, and for operation of the wind farm;
- reduce other pollutants resulting from the power generation industry, compared to a business-as-usual approach, such as $SO_2$ and soot.

**A.3. Project participants:**

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| Name of Party involved ((host) indicates a host Party) | Private and/or public entity(ies) project participants (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| P.R. China (host) | CGN Wind Power Co., Ltd. | No |
| United Kingdom of Great Britain and Northern Ireland | Carbon Resource Management Ltd. | No |

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

**A.4.1.1. Host Party(ies):**

>>

People's Republic of China

**A.4.1.2. Region/State/Province etc.:**

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Inner Mongolia Autonomous Region

**A.4.1.3. City/Town/Community etc.:**

>>

Zhurihe Town, Xilinguole League

**A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):**

>>

CGN Inner Mongolia Zhurihe Phase II Wind Farm Project lies in the middle north part of Inner Mongolia Autonomy Region of People's Republic of China. It is located at the attitude 42°27′11″ (N) and latitude 112°48′03″ (E). Figure 1 shows the location of project site.

**Figure 1 Map showing the location of the Project**



| A.4.2. Category(ies) of project activity: |
|---|

>>
Category: Renewable electricity in grid connected applications
Sector scope (1): Energy industries

| A.4.3. Technology to be employed by the project activity: |
|---|

>>
The 25 sets of 2000kW turbines were selected. The technical design of the wind turbines is advanced and deemed to reflect current good practice, and Key Technology Parameters are listed in Table1.

**Table 1. Key technology parameters of the turbine**

| Key Technology Parameter | Value |
|---|---|
| Rotor diameter (m) | 80 |
| Swept area($m^2$) | 5027 |
| Cut-in wind speed (m/s) | 3 |
| Rated wind speed (m/s) | 13.5 |
| Cut-out wind speed (m/s) | 25 |
| Hub height of the wind turbines (m) | 80 |
| Capacity(kW) | 2000 |
| Rated voltage(V) | 690 |

The net supplied power to the grid is expected to be 125,573MWh. The electricity generated from the project will be transmitted to Wenduer substation of NCPG via a 220kV transmission line.

The proposed project activity is the installation of a wind farm with an installed capacity of 50MW. The

total net supplied power to the grid is expected to be 125,573MWh once fully operational. The load factor of 28.7% is derived from the Feasibility Study Report determined by the third independent design institute with the highest grade, and also the value provided to the government while applying the project for implementation approval. The power generation is monitored by the electronic control and monitoring system in the onsite office, as well as through the electricity meter at the sub-station where the project is connected to the grid.

Prior to the implementation of the project activity, the electricity was generated by grid-connected power plants. Without the implementation of the project, this scenario would have continued and is considered the baseline scenario.

### A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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The ex-ante estimated annual emission reduction is 119,319 tonnes of $CO_2$e, the total estimated emission reductions is 835,233 tonnes of $CO_2$e over the first seven-year crediting period.

**Table 2. Estimated amount of emission reductions over the chosen crediting period**

| Period | Annual estimation of emission reductions ($tCO_2e$) |
|---|---|
| 01/07/2010-31/12/2010 | 59,660 |
| 2011 | 119,319 |
| 2012 | 119,319 |
| 2013 | 119,319 |
| 2014 | 119,319 |
| 2015 | 119,319 |
| 2016 | 119,319 |
| 01/01/2017-30/06/2017 | 59,660 |
| Total estimated reductions ($tCO_2e$) | 835,233 |
| Total number of crediting years | 7 |
| Annual average of estimated reductions over the crediting period ($tCO_2$ e) | 119,319 |

### A.4.5. Public funding of the project activity:

>>
There is no public funding for this project.

## SECTION B. Application of a baseline and monitoring methodology

### B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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The methodology applied in the proposed project is the approved baseline and monitoring methodology ACM0002 (version 10) –"Consolidated methodology for grid-connected electricity generation from renewable sources" (valid from 11 Jun 09 onwards).

The methodology prescribes the use of the latest version of AM_Tool_01 "Tool for the demonstration and assessment of additionality" (version 05.2) and AM_Tool_07 "Tool to calculate the emission factor for an electricity system" (version 02).

### B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

The applicability in approved methodology ACM0002 (version 10) related to wind farm project are as below:

*The methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s);*

*The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.*

The proposed project activity is a new grid-connected wind farm project and no renewable power plant was operated prior to the implementation at the proposed project activity site. Therefore, the methodology ACM0002 (version 10) is applicable to the project activity.

### B.3. Description of the sources and gases included in the project boundary:

>>

**Emission sources:**

For the baseline determination only $CO_2$ emissions from electricity generation by fossil fuel fired power plant that is displaced due to the project activity are taken into account.

**Spatial boundary:**

The spatial extend of the project boundary includes the project site and all power plants connected to NCPG. NCPG is an electricity system which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains.

Using the boundary definitions of the Chinese DNA[1], NCPG consists of Shandong, Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the project to regard NCPG as the project boundary.

NCPG connects with Northeast Power Grid (NEPG) and Central China Power Grid (CCPG); the electricity transfers are from NEPG and CCPG to NCPG. Electricity transfer from NEPG and CCPG, therefore, are taken into account.

**Table 3 Sources and gases in the project boundary**

| Source | | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|
| Baseline | Power supplied by NCPG | $CO_2$ | Yes | Following ACM0002 |
| | | $CH_4$ | No | Conservative / according to ACM0002 |
| | | $N_2O$ | No | Conservative / according to ACM0002 |
| Project activity | The proposed project | $CO_2$ | No | According to the methodology ACM0002 (version 10), the project emission for wind power plant is zero. |
| | | $CH_4$ | | |
| | | $N_2O$ | | |

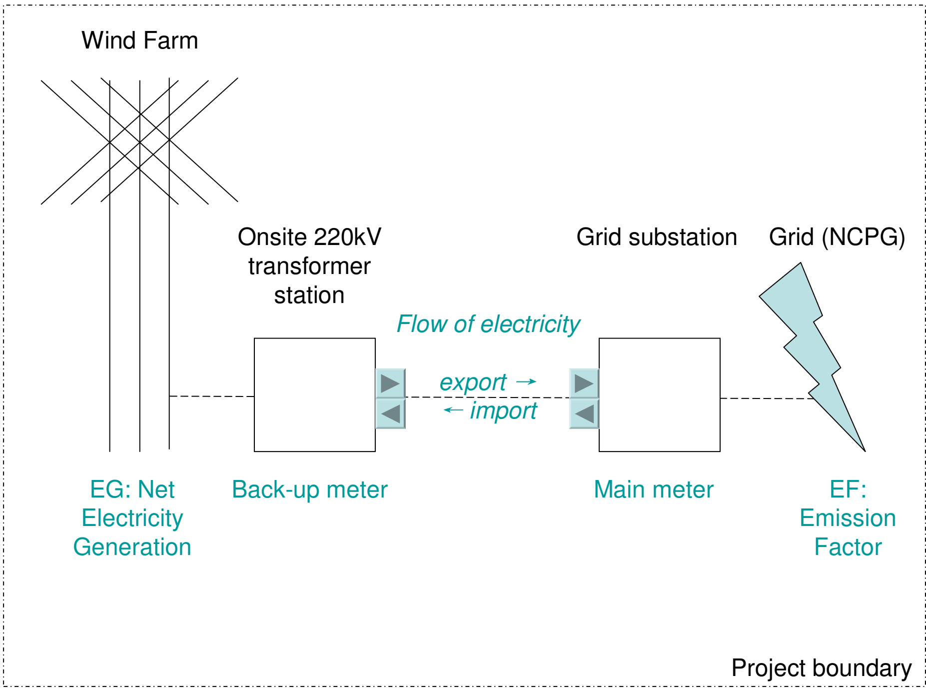


**Figure 2 Flow diagram of the project boundary**

**B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:**

>>

[1] Chinese DNA designates it on 02/07/2009 at http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

Because the project activity is the installation of a new grid-connected renewable power plant/unit, and is not a modification/retrofit of an existing plant/unit, the baseline scenario, according to methodology ACM0002, is the following:

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The baseline is determined and the combined margin calculated in Section B.6.

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):**

**>>**

*CDM consideration*

The incentive from the CDM had been taken into account prior to the starting date of the project activity, aiming to obtain the additional funding to secure the project financially. In the feasibility study of the project, the revenue from CDM was analyzed and it is concluded that if the project is registered as a CDM project, the revenue from CDM will make the project attractive financially. Therefore, the project owner decided to apply for CDM registration before the start date of the project.

**Table 4. Time schedule of the implementation of the project**

| Time | Milestone |
|---|---|
| March 2008 | EIA |
| 26 March 2008 | EIA approval |
| August 2008 | FSR completed, taking CER revenue into account |
| 16 December 2008 | Board Meeting to undertake the project as a proposed CDM project activity |
| 25 January 2009 | ERPA |
| 12 February 2009 | FSR approval |
| 2 March 2009 | Revised FSR |
| 15 March 2009 | Equipment Purchase Agreement (starting date) |
| 10 April 2009 | Construction permission |
| 25 May 2009 | Tower Purchase Agreement |
| 6 June 2009 | Construction contract of the wind generator foundations |

*Additionality*

The approved methodology requires the use of the latest version of the "Tool for the demonstration and assessment of additionality". The Tool consists of 4 steps as described below.

**Step 1. Identification of alternatives to the project activity consistent with current laws and regulations**

Realistic and credible alternatives to the project activity that can be part of the baseline scenario are defined through the following sub-steps:

***Sub-step 1a. Define alternatives to the project activity:***

The demonstration about the alternative that provides outputs or services comparable with the proposed CDM project activity is as follows:

*a) The proposed project activity undertaken without being registered as a CDM project activity.*
*b) A fossil fuel-fired power plant or other renewable energy with comparable capacity or electricity generation.*
*c) Continuation of the current situation: operation of grid-connected power plants and addition of new generation sources in the NCPG.*

Alternative a) is in compliance with all applicable legal and regulatory requirements. But according to the detailed analysis in step 2, this scenario is less attractive with low IRR and is not realistic without CDM financing.

There are no realistic and credible scenarios for alternative b). Fossil fuel-fired power generation would not be in compliance with current laws and regulations (see sub-step 1b). Besides wind energy, other kinds of renewable energy technologies, such as solar PV, geothermal, biomass and hydro are possible grid-connected sources that could be used in China. However, due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of similar installed capacity as the proposed project are not realistic alternatives in China. Biomass power generation faces barriers of high cost and technology and is difficult to be operated without policies& financial support.[2] Solar PV is blocked by high cost and technology, and is at undeveloped stage in China.[3] Geothermal power generation is ruled out due to lack of technology and policy support in China.[4] However, due to the lack of water resource recently years in project area, there is no commercially exploitable hydro power resource which can provide same electricity generation output of the proposed project activity.[5] Therefore, this alternative is not realistic.

Alternative c) is a realistic and feasible alternative which can provide outputs or services comparable with the proposed project and comply with applicable laws and regulations. Added capacity is dominated by thermal (coal-fired) power plants as determined in B.6. To meet the increasing electricity demand, the power grid company can increase the generation from operating units as well as from new built (thermal) power plants connected to the grid. Indeed, this is the current route followed by the industry to meet demand, as reflected in the baseline calculations data presented: nearly 90% of recently added capacity is thermal power.

***Sub-step 1b. Consistency with mandatory laws and regulations:***

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[2] http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm.
[3] http://finance.people.com.cn/GB/1038/59942/59949/6294546.html; http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=5884
[4] http://www.in-en.com/newenergy/html/newenergy-20072007011262784.html
[5] There is no hydro energy resource available in the project site: http://www.chneic.sh.cn/edu/ftp/sucaiku/dili/2006.3/contents/main/lm01/lm0102/01.htm

For the alternative (b) described in sub-step 1a, using comparable fossil fuel-fired power generation, both the installed capacity and the capacity that can generate the same annual electricity generation[6] would be prohibited. According to Chinese regulations fossil fuel-fired power plants of less than 135MW are prohibited to be built in the areas covered by the large grids such as provincial grids[7]. For these reasons, the possible alternative baseline scenario of building a fossil fuel-fired power plant conflicts with Chinese regulations.

According to the analysis in sub-step 1a and 1b, alternative (a) and alternative (c) are the realistic and feasible alternatives which comply with applicable laws and regulations.

**Step 2. Investment analysis**

The purpose of this step is to determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

To conduct the investment analysis, use the following sub-steps:

***Sub-step 2a. Determine appropriate analysis method***

Determine whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b):

The proposed project activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) should not be applied. Following the EB guidance on the assessment of investment analysis[8], if the alternative to the project activity is the supply of electricity from the grid, this is not considered an investment and a benchmark approach is considered appropriate. As the baseline alternative involves the continuation of current practices, supply of electricity from the grid, a benchmark analysis is used to identify whether the project is economically attractive (Option III). The use of a benchmark analysis is also in line with Chinese practice and is followed in the proposed project.

Therefore, the benchmark analysis (Option III) is adopted.

***Sub-step 2b – Option III. Apply benchmark analysis***

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China in 2002, the benchmark of total investment financial internal rate of return (IRR) of electric power industry is 8%, and only if the total investment IRR of the project is higher than or equivalent to this benchmark, the proposed project is financially feasible.

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[6] Using the average loadfactor of thermal plant connected to NEPG, as reported in the *China Electric Power Yearbook* (2008 Edition), of 5344 hours per year, a fossil fuel-fired plant of 23.50MW would generate 125,573 MWh per year.

[7] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6.

[8] Paragraph 15, 'Guidance on the Assessment of Investment Analysis' (version 02), EB 41 Annex 45.

***Sub-step 2c. Calculation and comparison of financial indicators:***

The investment estimation in the revised Feasibility Study Report was carried out by Inner Mongolia Power Exploration & Design Institute, which is an independent design institute with the highest certificate (Grade A, 050101-sj). The FSR is based on the national regulation and the material and equipment price level.

The relevant data is listed below, with more detail in the IRR calculation spreadsheet.

**Table 5. Data regarding finance**

| **Item** | **Value** |
|---|---|
| **Annual supplied power** | 125,573 MWh |
| **Static investment** | 486.66 million RMB Yuan |
| **On-grid tariff** | 0.51 RMB Yuan/kWh (including VAT) |
| **Average annual operation cost** | 11.61 million RMB Yuan |
| **Annual depreciation rate** | 6.33% |
| **Residual value** | 5% |
| **City build tax** | 5% |
| **Educational tax** | 3% |
| **Value added tax** | 8.5% |
| **Income tax** | 25% |
| **Operating life** | 20 years |

Table 6 shows the IRR of the project without and with CER revenue from CDM. It can be seen that IRR without CER revenue is below the benchmark 8%.

**Table 6. IRR analysis of the proposed project**

| **IRR without CDM** | **IRR with CDM** |
|---|---|
| **6.47%** | **9.78%** |

***Sub-step 2d. Sensitivity analysis***

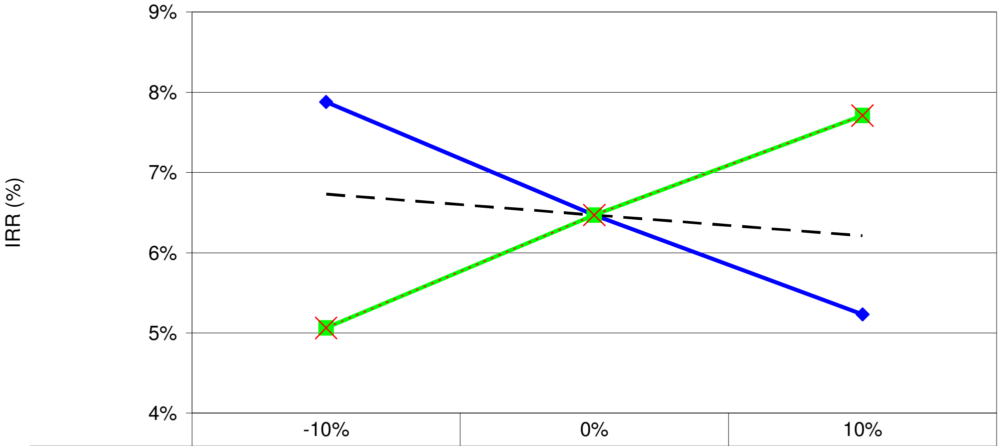
A sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality as this sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be economically or financially attractive.

According to EB Guidance, only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For a wind farm project without CDM funding, the factor that influences the IRR of total investment mainly includes:

1) Static investment;
2) Annual O&M cost;
3) On-grid tariff;
4) Net supplied electricity.

In line with EB guidance, the range of variations in the sensitivity analysis is between -10% and +10%, which is also in line with normal practice in China[9]. Greater variations are unlikely, as discussed below, and it is not considered that the benchmark can be reached without CDM registration. The outcomes of IRR sensitivities will be presented in the following figure.

**Figure 3: IRR sensitivity analysis for the proposed project**




| | -10% | 0% | 10% |
|---|---|---|---|
| Investment | 7.88% | 6.47% | 5.23% |
| Tariff | 5.06% | 6.47% | 7.71% |
| Generation | 5.06% | 6.47% | 7.71% |
| O & M | 6.73% | 6.47% | 6.21% |

Variation

Variations of -10% to +10% from the original assumptions for each of the critical variables are used in line with the regulations.

The IRR calculation spreadsheet shows the variations at which the benchmark would be reached: the static investment would need to decreases by 10.91%, the on-grid tariff or supplied power would need to increase by 12.40%; the annual O&M costs would need to decreases by 63.00%. None of these scenarios are likely to happen.

*Static investment*

For the wind farm project, the cost of turbine, engineering construction and related accessories consist the main budget of the static investment. As prices of turbines and other related equipment have been increasing in recent years, a decrease of the static investment is unlikely and there's a much greater likelihood of the static investment to go up.[10] Moreover, the Equipment Purchase Agreement, Tower Purchase Agreement, Installation contract of 35kv transformer and the Foundation construction contract

[9] "Codes on Compiling Feasibility Study Report of Wind Farms", issued by NDRC on 25/05/2005, prescribes the –10% to +10% variation range (http://www.windpower.org.cn/news/links/js_2005_0508.htm).

[10] http://energy.people.com.cn/GB/5720709.html. In the last 2 years, the demands for the turbines and its accessories exceeded the supply. Moreover the price of the raw material such as steel and cooper is increasing, which results in the price of wind turbines and equipments increasing, as demonstrated in *The Development of Wind Power*, published by People's Daily.

have been signed with the suppliers, the real costs in the contracts are higher than the sub-items estimated in the FSR. Therefore, it was not realistic for the developer to assume that investment costs could decrease by more than 10.91% in order to reach the benchmark.

*Tariff*

The tariff of 0.51 RMB/kWh used for the financial analysis in the FSR refers to the tariff document of NDRC of July 2008[11], the most recent available at the time of writing the FSR. According to the tariff documents issued by NDRC in recent years, the tariff of the wind farm projects in West Inner Mongolia is 0.51 RMB/kWh[12] [13], and the tariff will be fixed once approved by the government. Furthermore, according to the latest tariff document issued by NDRC in July 2009, the tariff in the Eastern Inner Mongolia is still 0.51 RMB/kWh[14]. Therefore, it is very unlikely that the tariff would be more than 12.40% higher than other recent wind farm projects, in order to reach the benchmark 8%.

*Generation*

The expected power generation of the proposed project is calculated by an independent qualified design institute with the highest grade (Grade A) in the electricity report on the basis of wind assessment records for 1988 to 2006 and output of the turbines, using a scientific approach applied internationally. The volume of annual generation therefore represents the long-term average power supply during the lifetime of the wind farm, taking into account yearly variations in power generation.

As the estimated net supplied power is calculated from the turbine availability, grid availability and the wind speed. The calculations for the proposed project are carried out using professional software designed for wind energy. The output is maximised through selection of the most suitable turbines, optimal turbine distribution in the wind farm, and considering the specific turbine characteristics, and the grid connection. The method of anticipating power generation is also approved by the government and is widely used in China for wind energy, including by the developer, who has significant experience with such projects.

Therefore, it is not credible to assume that generation from the proposed project would increase by more than 12.40% each year on average over the lifetime of the project in order the reach the benchmark 8%.

*O&M*

The O&M costs in the approved feasibility study were derived from the extensive experience of the developer and the design institute, as well as quotes supplied to the developer. The O & M costs includes the repair cost, salary & social welfare, materials fee, other fee the insurance fee. Based on the data published by the Inner Mongolia Autonomous Region Bureau of Statistic, there is an increasing tendency

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[11] Notification of electricity tariff for wind power projects issued by NDRC (Fa Gai Jia Ge [2008]1876), 23/07/2008

[12] Notification of electricity tariff for wind power projects issued by NDRC (Fa Gai Jia Ge [2007]1260), 09/06/2007

[13] Notification of electricity tariff for wind power projects issued by NDRC (Fa Gai Jia Ge [2007]3303), 03/12/2007

[14] Notification of electricity tariff for wind power projects issued by NDRC (Fa Gai Jia Ge [2009]1906), 20/07/2009

of the salary and materials purchasing prices[15]. therefore, it is unlikely for the O&M costs to drop by 63% to reach the benchmark rate of 8%,

*Conclusion*

The financial analysis shows that the project is not the most financially attractive alternative, and the sensitivity analysis shows that it is unlikely to be financially attractive compared to the benchmark under any reasonable variations in the assumptions. However, the revenue from the CERs will greatly improve the financial attractive of the proposed project, and it will also improve the ability to hedge risks.

In conclusion, the proposed project is not financially feasible without the revenue of CERs.

**Step 4. Common practice analysis**

***Sub-step 4a. Analyze other activities similar to the proposed project activity:***

In line with the EB guidance on the additionality tool, the common practice analysis is carried out on similar projects in the same region and taking place in a comparable environment with regards to regulatory framework, investment climate, access to technology, and access to financing, etc.

In China, the regulatory framework and investment climate for wind farm projects are only similar and comparable in the same Province/Autonomous Region. Wind farm project proposals are approved by the provincial DRC, and the projects' EIAs by the provincial Environmental Protection Bureau. The common practice analysis of the proposed project activity, therefore, covers projects in the Inner Mongolia Autonomous Region.

In April 2002, China implemented power sector reform to establish a more commercialized power market in China[16]. Since market condition for wind power project development has changed significantly since 2002, the common practice analysis starts from 2002.

The analysis is restricted to large scale project (using the CDM definition of large scale: >15MW) as small scale projects are not comparable in size to the 50MW installed by the proposed project activity.

Using the statistics of installed capacity of wind power in China, by Professor Shi Pengfei[17], wind farm projects in the same region (Inner Mongolia) and of similar scale (large scale) are listed below. CDM projects are excluded as per the EB guidance for common practice.

**Table 7. Wind farm project above 15MW located in Inner Mongolia Province**

| Name | Commissioning date | Capacity (MW) | Note |
|---|---|---|---|
| Dali Wind Power Project Phase III wind | 2004. 4 | 31.2 | Supported by national debt fund |

[15] http://www.nmgtj.gov.cn/Html/jjshfztjgb/2009-7/0/2385.shtml
[16] Chinese National Development and Reform Commission, Separate Power Plants from Network and Compete in Price to Enter Network, April 11, 2002, http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm.
[17] http://www.cwea.org.cn/download/display_info.asp?cid=&sid=&id=19 : Cumulative wind installation in China till 2006.

| | | | |
|---|---|---|---|
| farm | | | |
| Da Mao Qi Bailingmiao wind farm | 2008 | 35 | VER project under Golden Standard programme |

*Source: http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=&id=25; http://cdm.unfccc.int/Projects/registered.html; http://cdm.unfccc.int/Projects/Validation/index.html; http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2301.pdf.*

***Sub-step 4b. Discuss any similar options that are occurring:***

The existing wind farm projects do not call into question the claim that the project is financially unattractive as discussed in Step 2.

The Dali Wind Power Project Phase III belongs to "the fourth issue of national debt special fund project"[18], which is a demonstration project and enjoys favorable treatments which is not available for the proposed project.

Da Mao Qi Bailingmiao wind farm uses foreign capital and thus not eligible for CDM under the Chinese DNA rules. Therefore, the project had to be implemented as a Gold Standard VER project[19], meeting the same additionality criteria[20].

Several wind farm projects in Inner Mongolia have been registered as CDM projects in the last few years, and many others are applying for CDM registration, because they are financially unattractive without the additional income from CER sales, and face barriers.

As already described in the statement above, currently there are no wind farm projects with similar capacity in Inner Mongolia Autonomous Region. Therefore it can be concluded that the proposed project without CDM support is not common practice in Inner Mongolia Autonomous Region.

***→ If Sub-steps 4a and 4b are satisfied, i.e. similar activities cannot be observed or similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the project activity is additional.***

In conclusion, all the steps above are satisfied, the proposed CDM project is not the baseline scenario, and the project activity is additional.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

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**Project emissions**

[18] http://www.chifeng.gov.cn/html/2008-11/3130.shtml
[19] http://china.camcoglobal.com/zh/chinacasestudyview.obyx?cs=honiton.html
[20] See the PDD on http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/423/GS-VER(Retroactive)Honiton(1)-080111_GSP.pdf

According to the methodology, for most renewable energy project activities, $PE_y = 0$. However, the methodology prescribes project emission calculations for geothermal, solar thermal and hydro power plant. As a wind power plant, therefore, there are no project emissions according to the methodology:

$$PE_y = 0 \quad (1)$$

**Baseline emissions**

According to the methodology, the baseline emissions include only $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (2)$$

Where:
$BE_y$ is the baseline emissions in year y ($tCO_2$/yr).
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr).
$EF_{grid,CM,y}$ is the combined margin $CO_2$ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” ($tCO_2$/MWh).

*Calculation of $EG_{PJ,y}$*

As the proposed project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, the following applies:

$$EG_{PJ,y} = EG_{facility,y} \quad (3)$$

Where:
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr).
$EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr).

***Baseline emission factor***

In line with the methodology, the baseline emission factor is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y,}$) factors according to the following seven steps defined in the “Tool to calculate the emission factor for an electricity system”.

Details of the calculations and data follow the published data from the Chinese DNA and official

national statistics (China Energy Statistical Yearbook and China Electric Power Yearbook), and are presented in Annex 3 of the PDD and the EF calculation spreadsheet.

***Step 1. Identify the relevant electricity system***

As described in section B.3 the spatial extend of the project boundary includes the project site and all power plants connected to NCPG. NCPG is an electricity system which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains.

Using the boundary definitions of the Chinese DNA, NCPG consists of Shandong, Beijing, Tianjin, Hebei, Shanxi, and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the project to regard NCPG as the project boundary.

*Imports*

NCPG connects with Northeast Power Grid (NEPG) and Central China Power Grid (CCPG); the electricity transfers are from NEPG and CCPG to NCPG. Electricity transfers from NEPG and CCPG, therefore, are taken into account.

***Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)***

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Following the calculations of the DNA, and the statistical data available, Option I is chosen.

***Step 3. Select a method to determine the operating margin (OM)***

According to the tool, the calculation of the operating margin emission factor (EF_grid,OM,y) is based on one of the following methods:

(a) Simple OM; or
(b) Simple Adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM

Each method is described under Step 4.

According to the Tool, the simple OM method (option a) can only be used if low-cost / must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. This criterion is met (see Annex 3[21]) and therefore the project participants chose to use the simple OM method (option a).

[21] Page 733, *China Electric Power Yearbook* (2008 Edition), China Electric Power Press.

The Simple OM emissions factor can be calculated using either ex-ante or ex-post data vintages. The project participants have chosen to use the ex-ante option, and $EF_{grid,OM,y}$ is fixed for the duration of the first crediting period.

*Ex ante option: If the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. The three most recent years for which data is available are 2005-2007.*

***Step 4. Calculate the operating margin emission factor according to the selected method***

***(a) Simple OM***

The Simple OM emission factor is calculated as the generation-weighted average $CO_2$ emissions per unit net electricity generation ($tCO_2/MWh$) of all generating sources serving the system, not including low-cost / must-run power plants / units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a $CO_2$ emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:
(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

The criteria for Option B are met, as (a) the necessary data for Option A is not available as indicated in the calculations of the DNA, (b) only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, and (c) Option I is chosen in Step 2.

*Option B – Calculation based on total fuel consumption and electricity generation of the system*

According to the Tool, where Option B is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}) / EG_y \qquad (4)$$

Where:
$EF_{grid,OMsimple,y}$ is the simple operating margin $CO_2$ emission factor in year y ($tCO_2/MWh$)

$FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ is the $CO_2$ emission factor of fossil fuel type i in year y ($tCO_2/GJ$)
$EG_y$ is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i is all fossil fuel types combusted in power sources in the project electricity system in year y
y is the relevant year as per the data vintage chosen in Step 3 (i.e. 2005-2007, as the ex-ante option is chosen)

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports[22] to the grid. Electricity imports should be treated as one power plant m.

On the basis of the data available, the three-year average operating margin emission factor is calculated by the DNA as a full-generation-weighted average of the emission factors[23]:

$EF_{grid,OMsimlpe,y}$ = 1.0069 tCO2/MWh

***Step 5. Identify the group of power units to be included in the build margin***

The sample group of power units m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.[24] This option is chosen as it comprises larger annual generation than the five units built most recently.

Following the deviation[25], the latest statistical data available (from the China Power Yearbook) is used by the DNA to determine the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2007. The added generation capacity is the sample group of power units m used to calculate the build margin.

In terms of vintage of data, the project participants chose the ex-ante option (as for the OM calculation), and EF_grid,BM,y is fixed for the duration of the first crediting period:

*Option 1: ex-ante. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

[22] As described above, an import from a connected electricity system should be considered as one power source.
[23] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm
[24] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.
[25] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/Deviations.

***Step 6. Calculate the build margin emission factor***

The build margin emissions factor is the generation-weighted average emission factor ($tCO_2/MWh$) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \sum m \, (EG_{m,y} \times EF_{EL,m,y}) \, / \sum m \, EG_{m,y} \quad (5)$$

Where:
$EF_{grid,BM,y}$ is the build margin $CO_2$ emission factor in year y ($tCO_2/MWh$)
$EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ is the $CO_2$ emission factor of power unit m in year y ($tCO_2/MWh$)
m is the power units included in the build margin
y is the most recent historical year for which power generation data is available

The $CO_2$ emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.

Due to the limited availability of data on individual power units, the DNA uses the deviation above[26] to calculate the $CO_2$ emission factor of thermal power units and the build margin emission factor as follows (with more detail presented in Annex 3):

- The $CO_2$ emission factor used is the weighted average emission factor for thermal power plant calculated from the average net energy conversion efficiency of the best technologies commercially available in China for solid, liquid and gas fuels, weighted on the basis of the emissions from each of these fuel types in the latest year for which data is available.
- The added generation capacity is taken instead of generation, as with the determination of the cohort of plant included in the build margin.

The build margin emission factor is calculated by the DNA using this methodology[27]:

$EF_{grid,BM,y} = 0.7802 \; tCO_2/MWh$

***Step 7. Calculation of the combined margin emission factor***

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (6)$$

Where
$EF_{grid,OM,y}$ is the operating margin $CO_2$ emission factor in year y ($tCO_2/MWh$)
$w_{OM}$ is the weighting of operating margin emissions factor (%)

---

[26] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/Deviations.
[27] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

$EF_{grid,BM,y}$ is the build margin $CO_2$ emission factor in year y ($tCO_2/MWh$)
$w_{BM}$ is the weighting of build margin emissions factor (%).

According to the Tool, the default values for $w_{OM}$ and $w_{BM}$ for the wind projects in the first crediting period and the subsequent crediting period are: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature).

On the basis of these weights for the first crediting period, the combined margin emission factor is calculated, and are fixed ex-ante for the duration of the first crediting period (rounded down to the fourth digit) as follows and as shown in Table 8 below:

$EF_{grid,CM,y} = 0.9502\ tCO_2/MWh$

**Table 8 Emission factor calculation**

| | $CO_2$ emission factor ($tCO_2/MWh$) | Weighting (%) |
|---|---|---|
| Operating margin (see step 3) | 1.0069 | 75% |
| Build margin (see step 5) | 0.7802 | 25% |
| Combined margin | 0.9502 | |

These parameters will be recalculated at any renewal of the crediting period using the same steps 1-7 in the tool and the latest data available at that time.

Baseline emissions ($BE_y$) now can be calculated as the annual net generation of the Proposed Project ($EG_y$) multiplied by the combined margin $CO_2$ emission factor ($EF_{grid,CM,y}$).

**Leakage**

According to the methodology, no leakage is considered for the proposed project activity.

**Emission reductions**

The emission reduction $ER_y$ by the project activity during a given year $y$ is the difference between baseline emission ($BE_y$), project emissions ($PE_y$) and emission due to leakage ($LE_y$), as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (7)$$

Where the baseline emissions ($BE_y$ in $tCO_2$) are the product of the baseline emissions factor ($EF_y$ in $tCO_2/MWh$) times the electricity supplied by the project activity to the grid ($EG_y$ in MWh). The calculation formula is as follows:

$$BE_y = EG_y \times EG_{grid,CM,y} = (EG_{export,y} - EG_{consumption,y}) \times EF_{grid,CM,y} \quad (8)$$

With:
$EG_{export,y}$ is the quantity of annual electricity delivered to the grid by the proposed project(MWh);

$EG_{consumption,y}$ is the quantity of annual electricity purchased from the grid by the proposed project(MWh).

### B.6.2. Data and parameters that are available at validation:

| | |
|---|---|
| Data / Paramter: | $FC_{i,y}$ |
| Data unit: | Mass or volume |
| Description: | The amount of the fossil fuel i consumed in the project electricity system in year y |
| Source of data used: | China Energy Statistical Yearbook |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data for the calculations are based on official national statistics books. |
| Any comment: | |

| | |
|---|---|
| Data / Paramter: | $EG_{grid,y}$ and $EG_{m,y}$ |
| Data unit: | MWh |
| Description: | Electricity supplied to power grid by included sources in year y |
| Source of data used: | China Electric Power Yearbook |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data for the calculations are based on official national statistics books |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | $NCV_i$ |
| Data unit: | GJ/mass or volume unit |
| Description: | Net caloric value of fossil fuel type i consumed in the project electricity system in year y |
| Source of data used: | China Energy Statistic Yearbook |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data for the calculations are based on official national statistics books |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | $EF_{CO2,i,y}$ and $EF_{CO2,m,y}$ |
| Data unit: | tCO2/GJ |
| Description: | CO2 emission factor of fossil fuel type i in year y |
| Source of data used: | Calculated by multiplying Carbon emission factor of fossil fuel type i with |

| | |
|---|---|
| | 44/12 |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | International default values, and officially accepted by the Chinese DNA in their emission factor calculations. |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | Installed Capacity |
| Data unit: | MW |
| Description: | Installed capacity of the NEPG |
| Source of data used: | China Electric Power Yearbook |
| Value applied: | See Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data for the calculations are based on official national statistics books |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | Efficiency of the best technology commercially |
| Data unit: | |
| Description: | Best commercial available efficiency of coal, gas, oil fuel power plant |
| Source of data used: | http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239 |
| Value applied: | Best efficiency for coal plant is 38.10%;<br>Best efficiency for oil plant is 49.99%<br>Best efficiency for gas plant is 49.99% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The Chinese DNA has officially adopted, for their emission factor calculations. |
| Any comment: | |

**B.6.3. Ex-ante calculation of emission reductions:**

>>
The proposed project will generate 125,573 MWh electricity to the NCPG annually. The emission reduction $ER_y$ by the project activity during a giving year y is calculated as follows:

$$BE_y = EG_y \times EF_{grid,CM,y} = 125{,}573\text{MWh} \times 0.9502\ \text{tCO}_2/\text{MWh} = 119{,}319\ \text{tCO}_2$$

$$ER_y = BE_y - PE_y - LE_y = 119{,}319 - 0 - 0 = 119{,}319\ \text{tCO}_2$$

The emission reduction $ER_y$ by the project activity during a giving year $y$ is 119,319 $tCO_2$ and the total emission reduction in the first crediting period is 835,233 $tCO_2$.

### B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

**Table 9 Summary of the ex-ante estimation of emission reductions**

| Period | Estimation of the project activity emissions ($tCO_2e$) | Estimation of the baseline emissions ($tCO_2e$) | Estimation of leakage ($tCO_2e$) | Estimation of overall emission reductions ($tCO_2e$) |
|---|---|---|---|---|
| 01/07/2010-31/12/2010 | 0 | 59,660 | 0 | 59,660 |
| 2011 | 0 | 119,319 | 0 | 119,319 |
| 2012 | 0 | 119,319 | 0 | 119,319 |
| 2013 | 0 | 119,319 | 0 | 119,319 |
| 2014 | 0 | 119,319 | 0 | 119,319 |
| 2015 | 0 | 119,319 | 0 | 119,319 |
| 2016 | 0 | 119,319 | 0 | 119,319 |
| 01/01/2017-30/06/2017 | 0 | 59,660 | 0 | 59,660 |
| Total ($tCO_2e$) | 0 | 835,233 | 0 | 835,233 |

*Note: * Using 12-monthly periods from the start of the crediting period.*

### B.7. Application of the monitoring methodology and description of the monitoring plan:

The following baseline and monitoring methodology is used:

- ACM0002 version 10 "Consolidated methodology for grid-connected electricity generation from renewable sources" (valid from 11 Jun 09 onwards)

### B.7.1 Data and parameters monitored:

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period. 100% of the data are monitored if not indicated otherwise in the tables below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.

| **Data / Parameter:** | $EG_{facility,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity supplied to the grid by the project in period y |
| Source of data to be used: | Calculated as export of electricity ($EG_{export,y}$) minus consumption of electricity ($EG_{consumption,y}$). |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 125,573 MWh/year (once fully operational) |
| Description of measurement methods and procedures to be applied: | |
| QA/QC procedures to | |

| | |
|---|---|
| be applied: | |
| Any comment: | |

| **Data / Parameter:** | $EG_{export,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | The quantity of annual electricity delivered to the grid by the proposed project |
| Source of data to be used: | Electricity Meter |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 125,573 |
| Description of measurement methods and procedures to be applied: | Continuous measurement and at least monthly recording.<br>Main meter is installed at Wenduer substation.<br>Any error resulting from the meter shall not exceed 0.5%.<br>Designated person record the readings of the main meter each month.<br>The meters are bidirectional, which can record the import and export electricity generation. |
| QA/QC procedures to be applied: | 1. The export electricity supply to the grid is checked by receipt.<br>2. When the main meter fails to work normally, the readings of the back-up meter will be adopted.<br>3. The data will be kept during the crediting period and two years after.<br>4. The main meter will be calibrated once per year by a qualified calibration organization in accordance with industry standards. |
| Any comment: | |

| Data / Parameter: | $EG_{import,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | The quantity of annual electricity purchased from the grid by the proposed project |
| Source of data to be used: | Electricity Meter |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0 |
| Description of measurement methods and procedures to be applied: | Continuous measurement and at least monthly recording.<br>Main meter is installed at Wenduer substation.<br>Any error resulting from the meter shall not exceed 0.5%.<br>Designated person record the readings of the main meter each month.<br>The meters are bidirectional, which can record the import and export electricity generation. |
| QA/QC procedures to be applied: | 1. The import electricity supply to the grid is checked by receipt.<br>2. When the main meter fails to work normally, the readings of the back-up |

| | |
|---|---|
| | meter will be adopted.<br>3. The data will be kept during the crediting period and two years after.<br>4. The main meter will be calibrated once per year by a qualified calibration organization in accordance with industry standards. |
| Any comment: | |

### B.7.2. Description of the monitoring plan:

>>

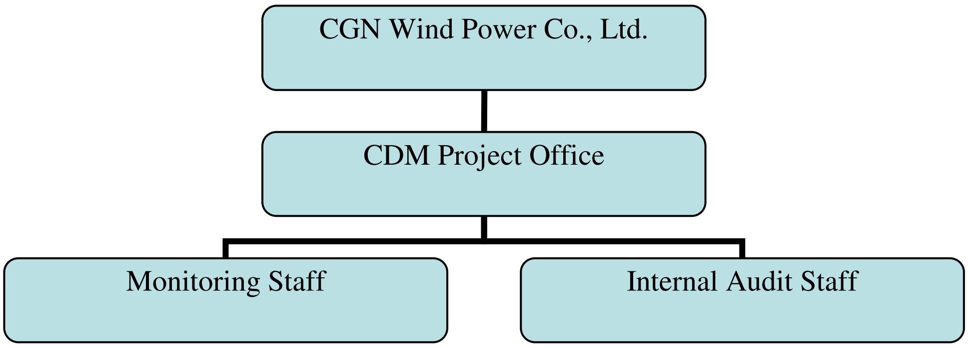
The proposed project adopts the approved monitoring methodology of ACM0002 to determine the emission reductions from the electricity generation from the wind farm. This plan describes in more detail the process. The detailed information about the monitoring plan is as follows:

**1. Monitoring and responsibility**

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with the project developer.

CDM manager is responsible for the monitoring and reporting of the wind farm.

The operating and management structure is illustrated as follows:




**2. The monitored data**

The quantity of electricity delivered to the grid by the proposed project ($EG_{export,y}$)and the electricity purchased from the grid by the proposed project ($EG_{import,y}$) will be monitored. The net electricity generation is calculated as the electricity delivered to the grid minus the electricity purchased from the grid.

**3. Installation of meters**

The quantity of annual electricity delivered to the grid by the proposed project ($EG_{export,y}$)and the electricity purchased from the grid by the proposed project ($EG_{import,y}$) will be monitored through the use of metering equipments in the substations. The main meter's precision is no less than 0.5. The electricity generation recorded by the main meter will be continuous measurement and at least monthly recording. The electricity generation will be monitored through the main meter installed in the substation. There is also a backup meter installed in this substation.

If the proposed project has to share the same transformer, substation or transmission line with some other wind farms, appropriate additional meters will be installed at the project site so that the electricity generation can be monitored for each wind farm separately so as to calculate the share of this wind farm of the net supply to the grid.

$EG_{export,\ y} = EG_{export,\ total} * EG_{project} / (EG_{project} + EG_{others})$
$EG_{import,\ y} = EG_{import,\ total}$
$EG_y = EG_{export,\ y} - EG_{import,\ y}$

$EG_{export,\ total}$ is total exported electricity to the grid based on the data metered by the main meter at the substation;
$EG_{import,\ total}$ is total imported electricity from the grid based on the data metered by the main meter at the substation;
$EG_{project}$ is the electricity generation of the proposed project based metered by separate meters at the project site;
$EG_{others}$ is the electricity generation of other wind farm projects based metered by other separate meters;
$EG_y$ is the net electricity supplied to the grid by the proposed project.

The separate meters installed at the proposed project site and other project sites will be continuous measurement and at least monthly recording. Designated person will record the readings of the meters. The precision of each meter is no less than 0.5. The separate meters will be calibrated according to the national regulation.

The $EG_{export,\ total}$ and $EG_{import,\ total}$ can be cross checked by sale receipt.

**4. Data monitoring**

The readings of the main meter are used for calculating the emission reductions when the main meter is in normal operation state. The monitoring processes are as follows:

(1) The designated persons from the grid company and the project company jointly record the main meter readings of the power to/from the grid monthly;
(2) The project developer provides the power grid company with a sale receipt after the power grid company has confirmed the settling accounts sheet, and archives a copy of the sale receipt;
(3) The project developer provides the DOE with the copy of sale receipts.

**5. Quality control**

1) Calibration of meters

The calibration of meters is conducted by a qualified organization in compliance with the national standard and sectional regulations to ensure the accuracy. The main meter is calibrated once per year. The meters must be sealed after calibration. The calibration records must be archived together with other monitoring records. When the main meter or back-up meter have a breakdown, the party finding the breakdown should tell another party and inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring state.

2) Emergency treatment

When the main meter or back-up meter have a breakdown, the electricity generation difference will be treated as follows:
(1) When one of the two meters has a breakdown, the readings of the other meter will be adopted;
(2) If both the main meter and back-up meter have breakdowns, the net electricity supplied to the grid will be calculated from the readings of other meters and deducting the line losses.

**6. Data management**

All monitoring data and records will be archived in electronic format as well as on paper. The electronic documents will be backed up on compact disc or hard disc. The project developer will also keep copies of sale receipts and prepare a monitoring report at the end of each year, which includes the net electricity generation, the monitoring data summary, the calibration records, and the emission reductions calculation.

All the electronic and paper documents will be archived during the crediting period plus two years.

**7. Reporting and Verification**

The steps required to meet the requirements for emissions reduction monitoring include:

- Designated person reads main meter and reports the result to power company and project owner monthly.
- The proposed project records readings from the backup meter monthly.
- The proposed project carries out an internal audit on and reports the readings to the DOE.

The project owner will facilitate the verification through providing the DOE all required necessary information.

**B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):**

>>
Date of completion of the baseline study and monitoring methodology: 03/06/2010.

Contact information of the entity and persons responsible:
- Carbon Resource Management (CRM) prepared the PDD. CRM is a project participant. Contact information is given in Annex 1.
- The persons preparing the documentation were:
    - Ms. Zhu Qiyan, Mr. Shi Xiangfeng, zqy@carbonresource.com, Tel: +86 10 8447 5246/8
    - Mr. Christiaan Vrolijk, cv@carbonresource.com, Tel: +44 20 7016 1426.

## SECTION C. Duration of the project activity / crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

>>
15/03/2009 (date of Equipment Purchase Agreement)

#### C.1.2. Expected operational lifetime of the project activity:

>>
20y-0m

### C.2. Choice of the crediting period and related information:

#### C.2.1. Renewable crediting period:

A renewable crediting period is chosen.

##### C.2.1.1. Starting date of the first crediting period:

>>
01/07/2010 (or the date of registration, whichever is later)

##### C.2.1.2. Length of the first crediting period:

>>
7y-0m

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

>>
Not applicable.

##### C.2.2.2. Length:

>>
Not applicable.

## SECTION D. Environmental impacts

### D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
An Environmental Impact Assessment (EIA) for the CGN Inner Mongolia Zhurihe Phase II Wind Farm Project has been completed by Inner Mongolia Power Exploration & Design Institute assigned by the project owner, and has been approved by the Environmental Protection Bureau of Inner Mongolia Autonomous Region.

The main impacts identified in the EIA are summarised below.

**1 The analysis of the environment impact in the construction period**

- Construction machine and construction activity will generate noise. Noise attenuation calculations show that at a distance of 1000m from the sound source, the noise will decrease to 31dB(A), which can satisfy the Class A requirement of Standard of Noise Limits for Construction Site (GB 3096-93). The nearest residential area is further than 1000m from the wind farm, so the impact of construction noise to the local region is light.
- The solid waste during construction period is mainly the soil and garbage. The soil will be used to backfill the road and the surrounding area of the wind farm. Therefore, the solid waste will do no harm to the local environment.
- The main air pollution during the construction period comes from the machines and transportation vehicles. Some measures will be taken to reduce impact of dust, such as sprinkling, covering and so on. Therefore, the construction will not cause much negative impact on the local air environment.
- The waste water from construction is mainly the waste water from construction staff and from the construction activity. The small quantity of waste water from the staff will be treated by septic tank and the deposit will be moved out to be disposed with the solid waste. So it will not have impact on the environment.
- The project temporarily takes some grass ground for construction use. The occupied land will be restored according to its characteristics after construction of the project and will ensure its re-utilization. Overall, it will not make the negative impact on the ecological system in the project site.

**2. Conclusion**

The proposed project does not put the much pressure on the local environment when generating renewable power. However it will bring great environmental benefit as well as the social benefit.

### D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>
Environmental impacts are not considered significant.The Environmental Protection Bureau of Inner Mongolia Autonomous Region has approved the EIA.

## SECTION E. Stakeholders' comments

### E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

In March 2008, the project owner carried out a survey of the local villagers and residents in the area. A 1 page questionnaire was designed to fill in and has the following sections:

Project introduction
Respondent's basic information and education level
Questions:

1. Do you agree with the development of the project?
2. Will the project have a negative impact on your environment of living, studying and working?
3. Will the project have a negative impact on the environment, such as noise, water and electromagnetism?
4. Will the project have a negative impact on the ecosystem?
5. Do you think the proposed project will have promotion in local economic development?
6. Do you have some suggestion about the project?

The questionnaires were sent to 50 households and the survey had a 100% response rate. The result of the survey indicated the support to the project. The survey is summarized in Section E.2 below.

### E.2. Summary of the comments received:

>>

Following is a summary of the local survey. The survey forms are available from the project owner.

**The statistic of opinion:**

- 100% of respondents agreed with the development of the project.
- 100% respondents believed that the project construction will not do harm to the environment.
- 100% believed that the project construction will do no harm to the ecosystem.
- 98% believed that the project construction will have no impact to the environment of living, studying and working and 2% didn't make any suggestions.
- 100% believed that the project construction will have positive impact on local economic development.

**Conclusions from the survey:**

The survey shows that the proposed project has strong local support among the local people. They all believe the proposed project will promote the local economic development and agree the project construction.

### E.3. Report on how due account was taken of any comments received:

>>

The villagers are all supportive of the proposed project and to date there has been no need to modify the project design according to the comments received.

The project owner has an overall environment-friendly plan to guarantee that the project has the minimum negative impact on the environment during the project construction and operation.

**Annex 1**

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

| | |
|---|---|
| Organization: | CGN Wind Power Co., Ltd. |
| Street/P.O.Box: | No.188, west of South 4th ring Road |
| Building: | No.2 Building, Area 12 of Advanced Business Park |
| City: | Beijing |
| State/Region: | Fengtai District |
| Postcode/ZIP: | 100070 |
| Country: | People's Republic of China |
| Telephone: | +86-10-63705651 |
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| E-Mail: | larnhart@hotmail.com |
| URL: | / |
| Represented by: | Chen Sui |
| Title: | |
| Salutation: | Mr. |
| Last Name: | Chen |
| Middle Name: | / |
| First Name: | Sui |
| Department: | / |
| Mobile: | / |
| Direct FAX: | |
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| | |
|---|---|
| Organization: | Carbon Resource Management Ltd |
| Street/P.O.Box: | 49 St. James's Street |
| Building: | |
| City: | London |
| State/Region: | |
| Postcode/ZIP: | SW1A 1JT |
| Country: | United Kingdom |
| Telephone: | +44 20 7016 1420 |
| FAX: | +44 20 7016 1421 |
| E-Mail: | |
| URL: | www.carbonresource.com |
| Represented by: | Nicholas A Clarke |
| Title: | Managing Director |
| Salutation: | Mr |
| Last Name: | Clarke |
| Middle Name: | A |
| First Name: | Nicholas |
| Department: | |
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| Personal e-mail: | deliveries@carbonresource.com |

## Annex 2

### INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project activity.

## Annex 3

## BASELINE INFORMATION

**Step 1. Identify the relevant electric power systems**

Following the DNA delineation, the project electricity system is the North China Power Grid (NCPG), consisting of six provincial grids: Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong.

The connected electricity systems are the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang, and Central China Power Grid (CCPG), consisting of six provincial grids: Jiangxi, Henan, Hubei, Hunan, Chongqing, Sichuan.

***Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)***

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Following the calculations of the DNA, and the statistical data available, Option I is chosen.

**Step 3. Select an operating margin (OM) method**

According to Tool to calculate the emission factor for an electricity system, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation on average in the five most recent years or based on long-term average hydroelectric production. The Simple OM method, therefore, is applicable to the proposed project as the share of low-cost/must-run generation does not exceed 1% in the most recent last 5 years, with the average being 0.8% as presented below.

The most recent year for which data is available in the yearbook is the year 2006. Table A1 presents the shares of generation from all sources including hydro power, other than thermal plants. The table shows that over the last five years generation from these sources has been consistently less than 1%.

**Table A1 Power generation in the North China Power Grid from 2003 to 2007**

| year | Low-cost/must-run generation ($10^8$ kWh) | Total Generation ($10^8$ kWh) | shared | Source (edition/page) |
|---|---|---|---|---|
| 2003 | 39.79 | 4,616.53 | 0.86% | 2004/p709 |
| 2004 | 40.32 | 5,308.04 | 0.76% | 2005/p474 |
| 2005 | 45.51 | 6,077.82 | 0.75% | 2006/p568 |
| 2006 | 48.03 | 6,099.70 | 0.79% | 2007/p638 |
| 2007 | 59.97 | 6,950.28 | 0.86% | 2008/748 |
| Total | 207.76 | 26,156.95 | | |
| Average | 41.552 | 5231.39 | 0.80% | |

*Source: China Electric Power Yearbook 2004 ～2008*

**Step 4. Calculate the operating margin emission factor according to the selected method**

**Table A2 Emission Factors of Fuels**

| Fuel | Low Calorific Value(kJ/kg,m³) | Emission Factor (tC/TJ) | Effective CO2 emission factor ($kgCO_2/TJ$) | Oxidation Factor |
|---|---|---|---|---|
| | | | 95% confidence interval | |
| Raw Coal | 20,908 | 25.8 | 87,300 | 100% |
| Cleaned Coal | 26,344 | 25.8 | 87,300 | 100% |
| Other Washed Coal | 8,363 | 25.8 | 87,300 | 100% |
| Mould Coal | 20,908 | 26.6 | 87,300 | 100% |
| Coke | 28,435 | 29.2 | 95,700 | 100% |
| Crude Oil | 41,816 | 20.0 | 71,100 | 100% |
| Gasoline | 43,070 | 18.9 | 67,500 | 100% |
| Diesel Oil | 42,652 | 20.2 | 72,600 | 100% |
| Fuel Oil | 41,816 | 21.1 | 75,500 | 100% |
| Natural Gas | 38,931 | 15.3 | 54,300 | 100% |
| Coke Oven Gas | 16,726 | 12.1 | 37,300 | 100% |
| Other Gas | 5,227 | 12.1 | 37,300 | 100% |
| LPG | 50,179 | 17.2 | 61,600 | 100% |
| Refinery Dry Gas | 46,055 | 15.7 | 48,200 | 100% |
| Other Oil Product | 38369 | 20 | 75,500 | 100% |
| Other Oven Product | 28,435 | 25.8 | 95,700 | 100% |
| Other Energy | 0 | 0 | - | 100% |

*Source: 1) 2006 IPCC Guidelines for National Greenhouse Gas Inventories， Volume 2 Energy；*
*2)China Power Year Book (2008)；*

*Fossil fuel consumption*

Fuel consumption is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province. Data is presented in Table A3 below. The share of emissions from coal consumption is also given in the table.

**Table A3 Energy consumption and CO2 emissions of NCPG in 2005-2007**

*2005*

| Fuel Type | Beijing | Tianjing | Hebei | Shanxi | Neimeng | Shandong | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|---|---|---|
| Coal | 897.75 | 1675.2 | 6726.5 | 6176.45 | 6277.23 | 10405.4 | **32158.53** | 586,979,486 |
| Cleaned coal | | | | | | 42.18 | **42.18** | 970,069 |
| Other washed coal | 6.57 | | 167.45 | 373.65 | | 108.69 | **656.36** | 4,792,018 |
| Coke | | | | | 0.21 | 0.11 | **0.32** | 8,708 |
| Coke oven gas | 0.64 | 0.75 | 0.62 | 21.08 | 0.39 | | **23.48** | 1,464,870 |
| Other coal gas | 16.09 | 7.86 | 38.83 | 9.88 | 18.37 | | **91.03** | 1,774,786 |
| Crude oil | | | | | 0.73 | | **0.73** | 21,704 |
| Gasoline | | | 0.01 | | | | **0.01** | 291 |
| Diesel | 0.48 | | 3.54 | | 0.12 | | **4.14** | 128,197 |
| Fuel oil | 12.25 | | 0.23 | | 0.06 | | **12.54** | 395,901 |
| LPG | | | | | | | **0** | 0 |
| Refinery gas | | | 9.02 | | | | **9.02** | 200,231 |
| Natural gas | 0.28 | 0.08 | | 2.76 | | | **3.12** | 659,553 |
| Other petro products | | | | | | | **0** | 0 |
| Other coke products | | | | | | | **0** | 0 |
| Other energy | 8.58 | | 32.35 | 69.31 | 7.27 | 118.9 | **236.41** | 0 |
| | | | **$CO_2$ Emission** | | | | **597,395,812$tCO_2$** | |

*Source: China Energy Statistical Year Book (2006);*

*2006*

| Fuel Type | Beijing | Tianjing | Hebei | Shanxi | Neimeng | Shandong | Fuel Consumption ($10^4$t,$10^8$m3) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|---|---|---|
| Coal | 796.63 | 1639.2 | 6867.99 | 6968.88 | 8404.05 | 10930.66 | **35607.41** | 649,930,803 |
| Cleaned coal | | | | | | 39.77 | **39.77** | 914,643 |
| Other washed coal | 6.36 | | 214.13 | 371.14 | 61.77 | 544.6 | **1198** | 8,746,477 |
| Shaped Coal | 7.97 | | | | | 27.77 | **35.74** | 652,351 |
| Coke | | | | | | 3.23 | **3.23** | 87,896 |
| Coke oven gas | 0.38 | 0.63 | 5.8 | 22.32 | 0.64 | 5.79 | **35.56** | 2,218,517 |
| Other coal gas | 20.66 | 6.58 | 69.72 | 13.79 | 22.76 | 7.22 | **140.73** | 2,743,772 |
| Crude oil | | | | | 0.74 | | **0.74** | 22,001 |
| Gasoline | | | 0.01 | | | | **0.01** | 291 |
| Diesel | 0.21 | | 3.01 | | 0.07 | 6.32 | **9.61** | 297,577 |
| Fuel oil | 6.38 | | 0.08 | | | 4.1 | **10.56** | 333,391 |
| LPG | | | | | | 0.01 | **0.01** | 309 |
| Refinery gas | | | 2.43 | | | 2.32 | **4.75** | 105,443 |
| Natural gas | 3.41 | 0.73 | | 0.53 | | | **4.67** | 987,216 |
| Other petro products | | | | | | 0.28 | **0.28** | 8,840 |
| Other coke products | | | | | | | **0** | 0 |
| Other energy | 6.83 | | 47.11 | 230.76 | 12.51 | 132.29 | **429.5** | 0 |
| | | | | **$CO_2$ Emission** | | | **667,049,525 $tCO_2$** | |

*Source: China Energy Statistical Year Book (2007);*

*2007*

| Fuel Type | Beijing | Tianjing | Hebei | Shanxi | Neimeng | Shandong | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|---|---|---|
| Coal | 816.17 | 1753.99 | 7716.13 | 7510.06 | 10434.25 | 11884.83 | **40115.43** | 732,214,267 |
| Cleaned coal | | | | | | 18.43 | **18.43** | 423,859 |
| Other washed coal | 5.76 | | 156.89 | 478.81 | 48.57 | 756.84 | **1446.87** | 10,563,452 |
| Shaped coal | 7.93 | | | | | 42.86 | **50.79** | 927,054 |
| Coke | | | 0.02 | | | 4.09 | **4.11** | 111,843 |
| Coke oven gas | 0.07 | 0.72 | 3.13 | 25.46 | 2.58 | 13.61 | **45.57** | 2,843,020 |
| Other coal gas | 11.8 | 7.6 | 88.38 | 72.8 | 28.17 | 29.64 | **238.39** | 4,647,821 |
| Crude oil | | | | | | | **0** | 0 |
| Gasoline | | | 0.01 | | | | **0.01** | 291 |
| Diesel | 0.33 | | 2.35 | | 0.62 | 5.08 | **8.38** | 259,490 |
| Fuel oil | 4.74 | | 0.18 | | | 2.35 | **7.27** | 229,522 |
| LPG | | | | | | | **0** | 0 |
| Refinery gas | 0.06 | | 2.85 | | | 1.65 | **4.56** | 101,225 |
| Natural gas | 5.03 | 0.73 | | 0.54 | 4.22 | 0.01 | **10.53** | 2,225,993 |
| Other petro products | 1.72 | | | | | | **1.72** | 54,302 |
| Other coke products | 4.74 | | | | | | **4.74** | 128,986 |
| Other energy | 11.94 | | 77.25 | 360.26 | 30.75 | 163.48 | **643.68** | 0 |
| | | | | **$CO_2$ Emission** | | | | **754,731,124 $tCO_2$** |

*Source: China Energy Statistical Year Book (2008);*

*Calculation of net generation from included sources*

Gross generation for each province is presented in the yearbooks. The data is also broken down into three categories: thermal, hydro and other sources. For the OM calculations, only thermal generation is included. Gross generation and own consumption are used to calculate net generation from included sources. The calculations are presented in Table A4 below.

**Table A4 Thermal generation, own consumption rate, and net supply in NCPG**

| Provincial Grid | 2005 | | | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Generation (MWh) | Self use rate (%) | On-grid generation (MWh) | Generation (MWh) | Self use rate (%) | On-grid generation (MWh) | Generation (MWh) | Self use rate (%) | On-grid generation (MWh) |
| Beijing | 20880000 | 7.73 | 19265976 | 20705000 | 7.51 | 19150055 | 22300000 | 7.51 | 20625270 |
| Tianjing | 36993000 | 6.63 | 34540364 | 35924000 | 6.86 | 33459614 | 39900000 | 6.53 | 37294530 |
| Hebei | 134348000 | 6.57 | 125521336 | 143888000 | 6.63 | 134348226 | 163300000 | 6.67 | 152407890 |
| Shanxi | 128785000 | 7.42 | 119229153 | 150250000 | 7.45 | 139056375 | 173400000 | 7.99 | 159545340 |
| Neimeng | 92345000 | 7.01 | 85871616 | 139593000 | 7.58 | 129011851 | 180100000 | 7.77 | 166106230 |
| Shandong | 189880000 | 7.14 | 176322568 | 230922000 | 7.12 | 214480354 | 259100000 | 7.23 | 240367070 |
| **Total** | | | 560751013 | | | 669506473 | | | 776346330 |

*Source：China Power Year Book ( 2006, 2007, 2008)；*

*Imports*

The connected electricity systems are the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang and the Central China Power Grid (CCPG), consisting of six provincial grids: Jiangxi, Henan, Hubei, Hunan, Chongqing and Sichuan. According to the tool, there is electricity transferring from the connected electricity systems to the project electricity system, so the $CO_2$ emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity systems should be determined to use "The weighted average operating margin (OM) emission rate of the exporting grid".

The average emission rate is calculated using the same steps as above for NCPG, namely fuel consumption and net generation as indicated in Table A5 – A10 below.

Fuel consumption in NEPG and CCPG is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province.

**Table A5 Fuel consumption and CO2 emissions of NEPG in 2005-2007(connected system)**

*2005*

| Fuel type | Liaoning | Jinlin | Heilongjiang | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|
| Coal | 4305.41 | 2446.13 | 3383.21 | **10134.75** | 184,986,389 |
| Cleaned coal | | | | **0** | 0 |
| Other washed coal | 524.74 | 19.26 | 24.16 | **568.16** | 4,148,079 |
| Coke | | | | **0** | 0 |
| Coke oven gas | 1.03 | 3.57 | 0.68 | **5.28** | 329,409 |
| Other coal gas | 12.62 | 8.37 | | **20.99** | 409,236 |
| Crude oil | 1.16 | | | **1.16** | 34,488 |
| Gasoline | | | | **0** | 0 |
| Diesel | 1.18 | 1.48 | 0.57 | **3.23** | 100,018 |
| Fuel oil | 9.32 | 2.46 | 1.55 | **13.33** | 420,842 |
| LPG | 0.12 | | | **0.12** | 3,709 |
| Refinery gas | 5.48 | | 1.32 | **6.8** | 150,950 |
| Natural gas | | 0.84 | 2.24 | **3.08** | 651,098 |
| Other petro products | | | | **0** | 0 |
| Other coke products | | | | **0** | 0 |
| Other energy | 16.18 | | | **16.18** | 0 |
| | | | $CO_2$ **Emission** | **191,234,218 $tCO_2$** | |

*Source: China Energy Statistical Year Book (2006);*

*2006*

| Fuel type | Liaoning | Jinlin | Heilongjiang | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|
| Coal | 4681.99 | 2738.24 | 3698.29 | **11118.52** | 202,942,832 |
| Cleaned coal | 0.03 | | | **0.03** | 690 |
| Other washed coal | 674.74 | 17.83 | 96 | **788.57** | 5,757,270 |
| Coke | 3.32 | | | **3.32** | 90,345 |
| Coke oven gas | 2.68 | 0.16 | 1.44 | **4.28** | 267,021 |
| Other coal gas | 55.26 | 1.43 | | **56.69** | 1,105,268 |
| Crude oil | 0.49 | | | **0.49** | 14,568 |
| Gasoline | | | | **0** | 0 |
| Diesel | 0.75 | 0.39 | 0.3 | **1.44** | 44,590 |
| Fuel oil | 11.73 | 0.45 | 1.44 | **13.62** | 429,998 |
| LPG | | | | **0** | 0 |
| Refinery gas | 8.55 | | 4.27 | **12.82** | 284,585 |
| Natural gas | | 0.19 | 2.1 | **2.29** | 484,095 |
| Other petro products | | | | **0** | 0 |
| Other coke products | | | | **0** | 0 |
| Other energy | 12.16 | 17.6 | 82.77 | **112.53** | 0 |
| | | $CO_2$ **Emission** | | **211,421,263t$CO_2$** | |

*Source: China Energy Statistical Year Book (2007);*

*2007*

| Fuel type | Liaoning | Jinlin | Heilongjiang | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|
| Coal | 4869.32 | 2873.45 | 3736.11 | **11478.88** | 209,520,369 |
| Cleaned coal | | | | **0** | 0 |
| Other washed coal | 747.85 | 16.52 | 106.81 | **871.18** | 6,360,397 |
| Shaped Coal | | | | **0** | 0 |
| Coke | 4.99 | | | **4.99** | 135,789 |
| Coke oven gas | 5.53 | 1.44 | 1.89 | **8.86** | 552,758 |
| Other coal gas | 68.38 | 9.06 | | **77.44** | 1,509,825 |
| Crude oil | 0.24 | | | **0.24** | 7,135 |
| Gasoline | | | | **0** | 0 |
| Diesel | 0.96 | 0.39 | 0.47 | **1.82** | 56,357 |
| Fuel oil | 8.43 | 0.45 | 1.48 | **10.36** | 327,076 |
| LPG | | | | **0** | 0 |
| Refinery gas | 7.33 | | 1.99 | **9.32** | 206,890 |
| Natural gas | | 0.02 | 2.03 | **2.05** | 433,360 |
| Other petro products | 0.01 | | | **0.01** | 316 |
| Other coke products | 0.46 | | | **0.46** | 12,518 |
| Other energy | 12.41 | 2.43 | 51.35 | **66.19** | 0 |
| | | | **$CO_2$ Emission** | **219,122,791 $tCO_2$** | |

*Source: China Energy Statistical Year Book (2008);*

Net generation is calculated from gross generation and self consumption data presented.

**Table A6 Power generation, own consumption and net supply in NEPG (2005-2007)**

| Province | 2005 | | | 2006 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Generation (MWh)** | **Self use rate (%)** | **On-grid generation (MWh)** | **Generation (MWh)** | **Self use rate (%)** | **On-grid generation (MWh)** | **Generation (MWh)** | **Self use rate (%)** | **On-grid generation (MWh)** |
| Liaoning | 83,697,000 | 7.03 | 77,813,101 | 96,282,000 | 6.62 | 89,908,132 | 106,500,000 | 7 | 99,045,000 |
| Jinlin | 35,294,000 | 6.59 | 32,968,125 | 38,576,000 | 6.78 | 35,960,547 | 43,700,000 | 7.68 | 40,343,840 |
| Heilongjiang | 58,000,000 | 7.96 | 53,383,200 | 62,964,000 | 7.85 | 58,021,326 | 68,400,000 | 7.67 | 63,153,720 |
| **Total** | | | 164,164,426 | | | 183,890,005 | | | 202,542,560 |

*Source: China Power Year Book (2006 - 2008);*

**Table A7 Fuel consumption and $CO_2$ emissions of CCPG in 2006(connected system)**

| Fuel type | Jiangxi | Henan | Hubei | Hunan | Chongqing | Sichuan | Fuel Consumption ($10^4$t,$10^8m^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|---|---|---|
| Coal | 1926.02 | 8098.01 | 3179.79 | 2454.48 | 1184.3 | 3285.22 | **20127.82** | 367,386,738 |
| Cleaned coal | | | | | 5.79 | | **5.79** | 133,160 |
| Other washed coal | 4.51 | 104.12 | | 8.59 | 79.21 | | **196.43** | 1,434,116 |
| Shaped coal | | | | | | 0.01 | **0.01** | 183 |
| Coke | | 17.23 | | 0.32 | | | **17.55** | 477,576 |
| Coke oven gas | | 0.52 | 1.07 | 4.24 | 0.38 | 0.01 | **6.22** | 388,053 |
| Other coal gas | 12.69 | 3.95 | | 1.7 | 4.36 | 0.01 | **22.71** | 442,770 |
| Crude oil | | 0.49 | | | | | **0.49** | 14,568 |
| Gasoline | | 0.01 | | | | | **0.01** | 291 |
| Diesel | 0.91 | 2.23 | 1.41 | 1.78 | 0.96 | | **7.29** | 225,737 |
| Fuel oil | 0.51 | 1.26 | 1.31 | 0.8 | 0.57 | 3.49 | **7.94** | 250,674 |
| LPG | | | | | | | **0** | 0 |
| Refinery gas | 0.86 | 8.1 | 1 | 0.97 | | | **10.93** | 242,630 |
| Natural gas | | | 0.28 | | 0.16 | 18.63 | **19.07** | 4,031,309 |
| Other petro products | | | | | | | **0** | 0 |
| Other coke products | | | | | | 0.01 | **0.01** | 272 |
| Other energy | 17.45 | 37.36 | 31.55 | 18.29 | 29.35 | | **134** | 0 |
| | | | | | **$CO_2$ Emission** | | | **375,028,077$tCO_2$** |

*Source: China Energy Statistical Year Book (2007)*

**Table A8 Power generation, own consumption and net supply in CCPG (2006)**

| Provincial grids | Generation (MWh) | Self use rate (%) | On-grid generation (MWh) |
|---|---|---|---|
| Jiangxi | 34449000 | 6.17 | 32323497 |
| Henan | 151235000 | 7.06 | 140557809 |
| Hubei | 54841000 | 2.75 | 53332873 |
| Hunan | 46408000 | 4.95 | 44110804 |
| Chongqing | 23487000 | 8.45 | 21502349 |
| Sichuan | 44193000 | 4.51 | 42199896 |
| **Total** | | | 334027226 |

*Source: China Power Year Book (2007)*

**Table A9 Fuel consumption and $CO_2$ emissions of CCPG in 2007(connected system)**

| Fuel type | Jiangxi | Henan | Hubei | Hunan | Chongqing | Sichuan | Fuel Consumption ($10^4$t,$10^8$m$^3$) | $CO_2$ Emission ($tCO_2$) |
|---|---|---|---|---|---|---|---|---|
| Coal | 2200.57 | 9357 | 3479.81 | 2683.81 | 1547.7 | 3239 | **22507.89** | 410,829,404 |
| Cleaned coal | | 3.07 | | | 3.8 | | **6.87** | 157,998 |
| Other washed coal | 0.04 | 87.16 | | 2.06 | 96.42 | | **185.68** | 1,355,631 |
| Shape coal | | | | | | 0.01 | **0.01** | 183 |
| Coke | | | | | | | **0** | 0 |
| Coke oven gas | 0.08 | 2.61 | 0.25 | 0.31 | 0.91 | | **4.16** | 259,534 |
| Other coal gas | 29.17 | 25.79 | | 24.69 | | 23.98 | **103.63** | 2,020,444 |
| Crude oil | | 0.43 | | | | | **0.43** | 12,784 |
| Gasoline | | | | 0.04 | 0.01 | | **0.05** | 1,454 |
| Diesel | 0.98 | 3.21 | 2.51 | 2.83 | 1.93 | | **11.46** | 354,863 |
| Fuel oil | 0.42 | 1.25 | 1.33 | 0.63 | 0.64 | 1.74 | **6.01** | 189,742 |
| LPG | | | | | | | **0** | 0 |
| Refinery gas | 1.43 | 10.01 | 0.97 | 0.7 | | | **13.11** | 291,022 |
| Natural gas | | 0.12 | 0.18 | | 0.2 | 1.87 | **2.37** | 501,007 |
| Other petro products | | | | | | | **0** | 0 |
| Other coke products | | | | | | | **0** | 0 |
| Other energy | 23.43 | 63.65 | 35.95 | 29.46 | 23.21 | | **175.7** | 0 |
| | | | | **$CO_2$ Emission** | | | | **415,974,066$tCO_2$** |

*Source: China Energy Statistical Year Book (2008)*

**Table A10 Power generation, own consumption and net supply in CCPG (2007)**

| Provincial grids | Generation (MWh) | Self use rate (%) | On-grid generation (MWh) |
|---|---|---|---|
| Jiangxi | 42100000 | 7.72 | 38849880 |
| Henan | 177300000 | 7.55 | 163913850 |
| Hubei | 60900000 | 6.69 | 56825790 |
| Hunan | 54200000 | 7.18 | 50308440 |
| Chongqing | 28800000 | 9.2 | 26150400 |
| Sichuan | 45100000 | 8.68 | 41185320 |
| **Total** | | | 377233680 |

*Source: China Power Year Book (2008)*

*Operating Margin Emission Factor calculations*

The Operating Margin Emissions Factor is now calculated from the data presented above using the formula below, including adjustment for imports from NEPG and CCPG. The calculation is shown in Table A11.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y}}{EG_y}$$

**Table A11 Operating margin emission factor calculation**

| | Unit | 2005 | 2006 | 2007 | 3-year total/average |
|---|---|---|---|---|---|
| **NCPG** | | | | | |
| Emission | $tCO_2$ | 597,395,812 | 667,049,525 | 754,731,124 | 2,019,176,461 |
| Generation | Wh | 560,751,013 | 669,506,473 | 776,346,330 | 2,006,603,816 |
| Import from NEPG | Wh | 3,929,000 | 2,618,060 | 1,789,750 | 8,336,810 |
| EF NEPG | $tCO_2$/MWh | 1.16489 | 1.14972 | 1.08186 | |
| Emissions from imports | $tCO_2$ | 4,576,870 | 3,010,025 | 1,936,260 | 9,523,155 |
| Import from CCPG | Wh | - | 497,060 | 803,000 | 1,300,060 |
| EF CCPG | $tCO_2$/MWh | - | 1.12157 | 1.10197 | |
| Emission from imports | $tCO_2$ | - | 557,486 | 884,885 | 1,442,371 |
| **Total** | | | | | |
| Emissions | $tCO_2$ | 601,972,682 | 670,617,036 | 757,552,269 | 2,030,141,987 |
| Generation supply | Wh | 564,680,013 | 672,621,593 | 778,939,080 | 2,016,240,686 |
| **Operating margin Emission Factor** | | | **1.0069 $tCO_2$/MWh** | | |

Based on above data, the simple OM emission factor of NCPG is calculated ex-ante using a 3-year generation-weighed average is 1.0069 $tCO_2e$/MWh.

**Step 5. Identify the cohort of power units to be included in the build margin**

The sample group of power units m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. This option is chosen as it comprises larger annual generation than the five units built most recently. Following the deviation, the latest statistical data available (from the China Power Yearbook 2008) is used by the DNA to determine the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2007. The added generation capacity is the sample group of power units *m* used to calculate the build margin.

**Step 6. Calculate the build margin emission factor**

As described in step4, because of the limited availability of publicly available data, this proposed project uses a substitute method accepted by EB to calculate $EF_{BM,y}$

*Sub-step 1: calculate the thermal emission factor*

Calculate the different $CO_2$ emission percentage of solid, liquid and gas fuel in the total emission of North China Power Grid in 2007 using new latest statistical data available from China Energy Statistical Year Book 2008.

**Table A12 Calculation of $CO_2$ Emission of North China Power Grid in 2007**

| Fuel type | $CO_2$ Emission ($tCO_2$) | Share |
|---|---|---|
| Coal | 744,369,461 | 98.63% |
| Oil | 543,604 | 0.07% |
| Gas | 9,818,059 | 1.30% |
| **Total** | **754,731,124** | **100%** |

*Source: China Energy Statistical Year Book (2008).*

$\lambda_{Coal} = 98.63\%$;

$\lambda_{Oil} = 0.07\%$;

$\lambda_{Gas} = 1.30\%$.

*Sub-step 2:*

Based the emission percentage ($\lambda_i$) of different kind fossil fuels and the corresponding emission factor ($EF_i$) according to the best technology commercially available in the China, the weighted emission factor of thermal power ($EF_{thermal}$) is calculated.

**Table A13 Calculation of $CO_2$ Emission Factor of Coal, Oil and Gas Fuel Power Plant with the Best Commercial Efficiency in China**

| Power plant type | Parameter | Best efficiency | Carbon factor ($kgCO_2/TJ$) | Oxidizing rate | $CO_2$ emission factor ($tCO_2/MWh$) |
|---|---|---|---|---|---|
| | | A | B | C | D=3.6/A/1,000,000*B*C |
| **Coal** | $EF_{Coal,Adv}$ | 38.10% | 87,300 | 100% | 0.8249 |
| **Gas** | $EF_{Gas,Adv}$ | 49.99% | 75,500 | 100% | 0.5437 |
| **Oil** | $EF_{Oil,Adv}$ | 49.99% | 54,300 | 100% | 0.3910 |

*http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm*

So, emission factor of thermal plant is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.8191 tCO_2/MWh$$

*Sub-step3:*

Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2008.

**Table A14 Identify the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2007**

| Power plant type | Capacity 2005<br>A | Capacity 2006<br>B | Capacity 2007<br>C | Added Capacity 2005-2007<br>D=C-A | Share |
|---|---|---|---|---|---|
| Thermal（MW） | 111,068.7 | 141,538 | 164,800 | 53,731.3 | 95.25% |
| Hydro（MW） | 3,216.2 | 4,004 | 4,510 | 1,293.8 | 2.29% |
| Nuclear（MW） | 0 | 0 | 0 | 0 | 0.00% |
| Wind（MW） | 335.5 | 937 | 1,719.2 | 1,383.7 | 2.45% |
| **Total（MW）** | 114,620.4 | 146,479 | 171,029.2 | 56,408.8 | 100.00% |
| **The ratio to C** | 67.02% | 85.65% | 100% | | |

*Source: China Power Year Book (2006, 2007, 2008).*

$EF_{BM} = (CAP_{Thermal} / CAP_{Total}) * EF_{Thermal}$

$CAP_{Thermal}$ is the thermal capacity among the new capacity from 2005 to 2007, and $CAP_{Total}$ is the total capacity from 2005 to 2007.

$EF_{BM}$= 0.8191×95.25% = 0.7802t$CO_2$/MWh

**Step 7. Calculation of the combined margin emission factor**
The combined margin emission factor is calculated as follows:

$EF_{grid,CM,y} = w_{OM} \bullet EF_{grid,OM,y} + w_{BM} \bullet EF_{grid,BM,y} = 0.75\times 1.0069 + 0.25\times 0.7802 = 0.9502$ t$CO_2$/MWh

# Annex 4

## MONITORING INFORMATION

No additional information.

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